Mail Stop Appeal Brief-Patents

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

APPEAL BRIEF

Ex parte Toshiaki KIMURA et al.

POLYLACTIC ACID FIBER, YARN PACKAGE, AND TEXTILE PRODUCTS

Appl. No.	:	10/525,092
Applicant	:	Toshiaki KIMURA et al.
Filed	:	February 23, 2005
TC/A.U.	:	1796
Examiner	:	Alicia Toscano
Dkt. No.	:	OGA-013
Cust. No.	:	20374

Confirmation No. 3275

Ronald J. Kubovcik

Registration No. 25,401
Attorney for Appellant

KUBOVCIK & KUBOVCIK
Crystal Gateway 3
Suite 1105
1215 South Clark Street
Arlington, VA 22202
Tel: (703) 412-9494
Fax: (703) 412-9345

Date: February 13, 2009

P:\02-09\oga-013-pto-appeal-brief.wpd

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No. : 10/525,092 Confirmation No. 3275

Applicant : Toshiaki KIMURA et al.

Filed : February 23, 2005

TC/A.U. : 1796

Examiner : Alicia Toscano

Dkt. No. : OGA-013

Cust. No. : 20374

BRIEF ON APPEAL

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

February 13, 2009

Sir:

This is an appeal from the decision dated May 15, 2008, of the primary Examiner finally rejecting claims 1 and 5-13 in this application.

(i) REAL PARTY IN INTEREST

The real party in interest is Toray Industries, Inc., Tokyo, Japan.

(ii) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences which will

directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

(iii) STATUS OF CLAIMS

Claims 1 and 5-31 are pending in this application. Claims 2-4 have been canceled. Claims 1 and 5-31 are rejected. Claims 1 and 5-31 are on appeal.

Claims 1 and 5-31 as finally rejected appear in the attached Appendix.

(iv) STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection.

(v) SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1, the only independent claim on appeal, recites a polylactic acid fiber. The polylactic acid fiber comprises a polylactic acid containing fatty acid bisamide and/or alkyl-substituted fatty acid monoamide in an amount of 0.1 to 5 weight % in relation to the whole of fiber. (Specification, paragraph [0018], page 3, lines 2 and 3 from the bottom of the page, and paragraph [0079], page 11, line 9 from the bottom of the page, to page 12, line 7). The fatty acid bisamide and alkyl-substituted

fatty acid monoamide have a melting point of 100 °C or higher. (Specification, paragraph [0074], page 10, lines 23 and 24). The polylactic acid fiber is produced by a melt-spinning method (specification, paragraph [0078], page 11, lines 18-27, and paragraph [0081], page 12, lines 12-27) and has a b* value in fiber color system of L*a*b* in the range of -1 to 5 (specification, paragraph [0019], page 3, last line, to page 4, line 1, and paragraph [0128], page 21, line 11 from the bottom of the page, to page 22, line 5) and a single fiber fineness of 0.1-10 dtex (specification, paragraph [0122], page 20, lines 5-16 from the bottom of the page). The fiber-constituting polylactic acid is 40 eq/t or less in carboxyl end group amount. (Specification, paragraph [0060], page 7, lines 10-14).

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are:

(1) whether claims 1, 5-11, 13, 15, 16, 19, 20, 21, 23 and 26-31 are unpatentable under 35 U.S.C. 103(a) over Nishimura (JP 2001-131827) in view of Tan (WO 02/12395; U.S. Patent No. 6,710,135 used as English equivalent) and in further view of Kondo (U.S. Patent No. 5,593,778) and Zeitler (U.S. Patent No. 5,811,508);

(2) whether claims 1, 5-11, 13, 15, 16, 19, 20, 21, 23 and

26-31 under 35 U.S.C. 103(a) over Obuchi (U.S. Patent No. 6,417,294) in view of Tan and further in view of Kondo and Zeitler;

(3) whether claims 13, 15, 24 and 25 under 35 U.S.C. 103(a) over Nishimura, Tan, Zeitler and Kondo or Obuchi, Tan, Zeitler and Kondo, in further view of Anderson (U.S. Patent No. 4,009,513); and

(4) whether claims 12, 14, 17, 18 and 22 under 35 U.S.C. 103(a) over Nishimura, Tan, Zeitler and Kondo or Obuchi, Tan, Zeitler and Kando in view of Yamakita (U.S. Patent Publication No. 2003/0079297).

(vii) ARGUMENTS

(1) Rejection under 35 U.S.C. 103(a) over Nishimura (JP 2001-131827) in view of Tan (WO 02/12395; U.S. Patent No. 6,710,135 used as English equivalent) and in further view of Kondo (U.S. Patent No. 5,593,778) and Zeitler (U.S. Patent No. 5,811,508)

(a) Claims 1, 5-11, 13, 15, 16, 19, 20, 21, 23 and 26-31

Nishimura is cited by the Office as disclosing polylactic acid based flat yarns comprising polylactic acid, with a molecular weight of 90,000-110,000, and a lubricant in the amount of 0.5-5 wt%. The Office states that the lubricant may be ethylene bis-oleic amide or an alkyl-substituted fatty acid monoamide. Nishimura does not disclose the melt spun fibers.

Tan is cited by the Office as disclosing polylactic acid resin compositions having a molecular weight from 2000-500,000, used for

nonwoven fabrics and yarn, which may contain a "lubricant". The Office characterizes Tan as disclosing melt spinning to be the functional equivalent of tape yarn formation because Tan describes that the composition is useful for tape yarn production as well as melt spun yarn.

Kondo is cited by the Office as disclosing biodegradable copolyester compositions which are melt spun into fibers having a typical fineness of 5-55 dtex.

Zeitler is cited by the Office as disclosing hydrolysis resistant polyester fibers, that resistance of a polyester to hydrolysis depends on the number of carboxyl end groups, and that decreasing the number of carboxyl end groups improves the resistance to hydrolysis.

The position of the Office is that it would have been obvious to a person of ordinary skill in the art to modify Nishimura to produce fibers from the compositions disclosed therein by melt spinning because Tan teaches melt spinning to be functionally equivalent to tape yarn production, to modify the fiber resulting from the combination of Nishimura and Tan to have a fineness of 5-55 dtex because Kondo teaches that thinner fibers increase the softness of the resulting article, and to use a carboxyl equivalent of less than 10 meq as taught by Zeitler to form a fiber of

superior hydrolysis resistance.

(i) THE OFFICE HAS NOT SUPPORTED A CASE OF PRIMA FACIE OBVIOUSNESS OF THE CLAIMS OF THE APPLICATION AND, WHEN THE TEACHINGS OF THE CITED PRIOR ART AS A WHOLE ARE CONSIDERED, A PERSON OF ORDINARY SKILL IN THE ART WOULD NOT HAVE HAD A REASONABLE EXPECTATION THAT FIBERS HAVING A FINENESS OF 0.1-10 dtex COULD BE SUCCESSFULLY PRODUCED FROM THE COMPOSITIONS OF NISHIMURA BY MELT SPINNING

The polylactic acid fiber of the present invention as claimed in claim 1 is characterized in that it is produced by a melt-spinning method and has a single fiber fineness of 0.1-10 dtex. In the carrying out of melt spinning of a fiber having such a small single fiber fineness, if foreign matter is permitted to exist in the melt polymer, nozzle clogging tends to occur when the melt-polymer passes through spinnerets, giving rise to yarn cut. Thus, before the melt polymer is spun through spinnerets, the melt polymer is passed through a filtering layer of very fine mesh in order to remove foreign matter. Due to the requirement for filtering in melt-spinning, the polymer is maintained in a molten state at a high temperature for a long residence time during the time between melting and spinning through spinnerets.

In contrast, in the cases of a forming a molded product by extrusion molding or injection molding, such as a film in Nishimura, the process can be carried out even if minute foreign matter exists in the material polymer, so that no filter layer,

i.e., filtering, is provided in the production system. Thus, the polymer is not in a molten state during a long residence time, and the thermal history of exposure to a high temperature is much shorter in the case of such product as compared with the case of the fiber having a small single fiber fineness and produced by melt-spinning. For this reason, additives used in the forming of a molded product such as a film by extrusion molding or injection molding cannot be reasonably expected to exhibit the same properties and characteristics when used in the melt spinning of fibers having a small single fiber fineness.

Regarding the fatty acid bisamide and/or alkyl-substituted fatty acid monoamide defined in claim 1, the reactivity of the amide is relatively low as compared to other general fatty acid monoamides, and reaction of the fatty acid bisamide and/or alkyl-substituted fatty acid monoamide with the polylactic acid in or during melt-spinning rarely occurs. Additionally, the fatty acid bisamide and/or alkyl-substituted fatty acid monoamide has(have) a remarkable heat resistance, so that according to the claimed invention, not only is it possible to lower a surface friction coefficient of polylactic acid fiber but it is also feasible to provide a high quality fiber which does not present a tincture of yellow by setting the b* value to be in the range of -1 to 5.

Nishimura discloses the production of a flat yarn by longitudinally slitting a uniaxial-stretch film produced by extrusion. Thus, the flat yarn of Nishimura is not a fiber produced from a polymer material having a long thermal history as is experienced by the polylactic acid fiber produced by melt-spinning according to amended claim 1. Moreover, because the flat yarn has a large fineness, it does not have the problems of a lowering of wear resistance and/or of color tone. The only fatty acid amide based lubricant used in the examples of Nishimura is erucic acid amide. The erucic acid amide is not a "fatty acid bisamide and/or alkyl-substituted fatty acid monoamide" as required in claim 1 of the present application.

Moreover, paragraph [0013] of Nishimura describes that fibrillation occurs in connection with a fiber (containing the fatty acid lubricant) having a fineness of less than 500 dtex.

Tan describes a melt-spun yarn of polylactic acid composition and identifies a "lubricant" as an example of a functional additive (col. 7, line 44). The particular object for which the addition of lubricant is made is not described and no specific substance is disclosed for use as the lubricant.

In col. 10, lines 26-39, Tan merely describes tape yarn forming and yarn forming as general examples of processes for

producing a molded or processed article from the composition disclosed therein.

Kondo discloses nothing concerning melt spinning of a composition comprising lubricants as disclosed in Nishimura.

Zeitler discloses carboxyl end-group concentrations of polyethylene terepthalate but contains no reference to polylactic acid. This is significant because the relationship between carboxyl end group concentration and the durability of a polymer differs largely depending on the kind of polymer. Zeitler also contains no reference to a "fatty acid bisamide and alkyl-substituted fatty acid monoamide having a melting point of 100 °C or higher".

A person of ordinary skill in the art would not have had a reasonable expectation of success of forming the composition of Nishimura into a lower dtex fiber by melt spinning because, first, as noted above, Nishimura itself discloses that good results will not be obtained. Nishimura suggests in paragraph [[0013] that fibrillation occurs in connection with a fiber (containing a fatty acid lubricant) having a fineness of less than 500 dtex. There is no basis for a conclusion that a person skilled in the art would have reasonably expected good results to be obtained in the production of fibers from the compositions of Nishimura that have

a significantly smaller single fiber fineness when the only relevant disclosure of Nishimura suggests that good results will not be obtained.

Second, the Office has not demonstrated that a person of ordinary skill in the art would reasonably expect the use of melt spinning to be equivalent to tape yarn production using the compositions of Nishimura. (It is noted that the Office has the initial burden of supporting a case of prima facie obviousness and, thus, showing such expected equivalency).

The Office relies on Tan for such expected equivalency. However, the compositions of Tan are not the same compositions as disclosed in Nishimura and Obuchi. Tan describes a "lubricant" as an example of an additive (col. 7, line 44) to a polylactic acid composition. The particular object for which the addition of lubricant is made is not known and no specific material or substance is disclosed for use as the lubricant.

In col. 10, lines 26-39, Tan describes tape yarn forming and yarn forming as examples of processes for producing a molded or processed article from the compositions disclosed therein. The Office has not provided reasons why any results obtained using the compositions of Tan containing an unspecified lubricant would be reasonably expected to apply to the compositions of Nishimura

especially in view of the known difficulties as explained above of providing by a melt-spinning process a high-quality polylactic acid fiber having remarkable characteristics in respect of the wear resistance and the ability to smoothly pass through processing and presenting no tincture of yellow.

Third, melt-spun fibers and flat yarn have different properties and a person of ordinary skill in the art could not reasonably expect all compositions that can be formed into a flat (tape) yarn to be capable of being melt-spun. The differences between melt-spun and flat yarns is explained below.

Melt-spun fibers have a cross-sectional shape surrounded by a convexly curved line, whereas the cross-sectional shape of flat yarns is such as being defined by parallel rectilinear lines and is similar to a film having a certain thickness. Therefore, when it is contacted with another object, a melt-spun fiber undergoes point-contact, while a flat yarn has face-contact. Accompanying such face-contact, stress tends to concentrate along edges of a flat yarn, so that a flat yarn is prone to undergo fibrillation (longitudinal cracking). To prevent such phenomenon from occurring, it is a common practice in the art to add a lubricant called an anti-blocking agent to the compositions to be formed into flat yarns. The lubricants described in Nishimura come under the

category of the above anti-blocking agents.

In contrast to the above, melt-spun fibers have a cross-sectional shape surrounded by a convexly curved line as noted above and are, accordingly, unlikely to undergo fibrillation. The melt-spun fiber according to the present invention is, moreover, ultra-fine, has a relatively large specific surface area and is prone to wear deterioration, so that wear resistance is strongly demanded of the fiber. The polylactic acid fibers according to the present invention are so fine as to have a single fiber fineness of 0.1 to 10 dtex. As yarn fineness is smaller, specific surface area is larger. For example, the specific surface area of a melt-spun fiber having a round cross-sectional shape and a single fiber fineness of 10 dtex is found by calculation to be so large as to be about 4.7 times the specific surface area of a 500 dtex flat yarn disclosed in Nishimura, assuming a thickness of 100 μm. According to the present invention, specific fatty acid amides are blended in fibers having a very large specific surface area as above and thereby an improvement is attained in or relating to the wear resistance.

As pointed out above, the fatty acid amides disclosed in or by Nishimura are anti-blocking agents for obviating fibrillation of flat yarns, and therefore their function or activity is absolutely

different from that of the specific fatty acid amides used in or for the present invention, i.e., to enhance the wear resistance in the case of fibers having an extremely small single fiber fineness.

In light of these differences, the art-skilled person, would not have had the necessary reasonable expectation of success of melt spinning the compositions of Nishimura to obtain fibers having a single fiber fineness of 0.1 to 10 dtex as required in the claims of the present application.

Fourth, the data of the 132 Declaration of Katsuhiko MOCHIZUKI submitted with the response filed March 21, 2008, to the Office Action dated December 21, 2007, shows that melt spinning cannot be applied to the composition of Nishimura with good results.

The Additional Comparative Examples 1-3 in Table 1 of the Declaration represent examples in which the polymer compositions of Examples 1-3 of Nishimura were spun to filaments having a mono-filament fineness of 5-50 d (5.5-55 dtex) as taught by Kondo, by the melt-spinning method taught by Tan.

The data of Table 1 of the Declaration show that the polylactic acid fibers obtained according to the Additional Comparative Examples 1-3 are poor in respect of the solidity to dry friction and solidity to wet friction and have poor wear resistance. Additionally, the Declaration also shows that the

polylactic acid fibers obtained in the Additional Comparative Examples 1-3 are poor with respect further to the color tone (b* values), dyeing evenness, yarn breaks during spinning, draw superiority ratio and the halt of loom as well.

These data rebut the position of the Office that melt spinning and tape yarn forming are functionally equivalent processes for use with all polylactic acid compositions and rebut the conclusion of the office that it would have been obvious to apply a melt spinning process to the compositions of Nishimura with good results.

Moreover, functional equivalency, if it did exist, does not establish obviousness. *See In re Scott*, 139 USPQ 297, 299 (CCPA 1963) ("The examiner and the board appear to hold that the mere existence of 'functional and mechanical equivalence' establishes 'obviousness.' We think this involves a non-sequitur.") The record here is insufficient to establish that a person of ordinary skill in the art would have reasonably expected that the composition of Nishimura could be melt spun into fibers having the small single fiber fineness recited in the claims on appeal.

For the above reasons, the Office has not provided reasons with a rationale underpinning why a person of ordinary skill in the art would have reasonably expected melt spinning to be applicable

to the composition of Nishimura as modified by Kondo and Zeitler.

(ii) THE COMBINATION OF NISHIMURA, TAN, KONDO AND ZEITLER FAILS TO DISCLOSE OR SUGGEST THE PROPERTIES RESULTING FROM THE USE OF THE SPECIFIC FATTY ACID AMIDES ACCORDING TO THE PRESENT INVENTION IN THE MELT-SPINNING OF POLYLACTIC ACID

None of Nishimura, Tan, Kondo and Zeitler, alone or in any combination, suggests that the specific fatty acid bisamide and/or alkyl-substituted fatty acid monoamide defined in claim 1 of the present application, as opposed to other fatty acid amides such as, for example, (unsubstituted) fatty acid monoamide, can improve the wear resistance and the ability to smoothly pass through processing steps of polylactic acid fiber, bring the b* value of the fiber down to -1 to 5, and attain a high quality presenting no yellow tincture.

The fatty acid bisamide and/or alkyl-substituted fatty acid monoamide recited in claim 1 of the present application having a melting point not lower than 100 °C can exhibit a remarkable heat resistance. Once they are processed into a textile product, they have remarkable intermediate set property and dyeing property, and when exposed to a hot environment, they can be prevented from undergoing sublimation and uneven dyeing is suppressed (see paragraphs [0068] and [0074] of the of the present specification).

The above can be seen, for example, from the following:

Dyeing unevenness is found in the examples of the present specification, i.e., "○: A slight dyeing unevenness was recognized" in the case of SS (N-stearyl stearic acid amide) having a melting point of 95 °C (Examples 8, 19, and 24 in the present application). However, it is "◎: No dyeing unevenness was recognized" where the "specific fatty acid amide" has a melting point not lower than 100 °C as in each of the cases of EBA (ethylenebisstearic acid amide) having a melting point of 144 °C (Examples 1, 18 and 25) and of KBA (m-xylylenebisstearic acid amide) having a melting point of 123 °C (Examples 7 and 23).

Also, claim 1 recites that the carboxyl end group concentration of the polylactic acid is 40 eq/t or less. This results in suppression of the hydrolysis of the fiber (paragraph [0060] of the present specification) and further improves the fiber durability as a result of this in synergism with the specific fatty acid amino having a melting point not lower than 100 °C.

As explained above, in the carrying out of melt spinning, the polylactic acid is maintained in a molten state at a high temperature for a long time during the time between melting and spinning through spinnerets, and thermal deterioration thereof proceeds. If the polymer undergoes thermal deterioration, it becomes difficult to process such polymer to such a very fine yarn

as having a single fiber fineness of 0.1-10 dtex without yarn breaking. Thus, by preferably limiting the carboxyl end concentration of the polylactic acid to 40 eq/t or less and, additionally, using a specific fatty acid amide "having a melting point of 100 °C or above", the above difficulty is overcome and it is possible to obtain a high quality fiber remarkable in respect of each of the wear resistance, process passability and color tone.

In the Advisory Action of September 28, 2007, the Office states that the properties of the polylactic acid fibers of the present invention are not claimed and would otherwise be inherent "since the compositional elements are met."

The unexpected properties of applicants' fibers need not be recited in the claims because the properties are inherent in the fibers as claimed. However, the claims do, in fact, recite unexpected properties of the fibers as noted above.

Regarding the position of the Office that the properties of the claimed polylactic acid fibers would be inherent in fibers which meet the limitations of the claims, such properties would, of course, be inherent in such fibers because the fibers would be those of the present invention. However, applicants claimed fibers are not disclosed in the prior art, i.e., no patent or publication discloses applicants' fibers, and applicants are not required to

compare their invention with subject matter that is not in the prior art. As noted in MPEP § 716.02(e)(III):

> Although evidence of unexpected results must compare the claimed invention with the closest prior art, applicant is not required to compare the claimed invention with subject matter that does not exist in the prior art. *In re Geiger*, 815 F.2d 686, 689, 2 USPQ2d 1276, 1279 (Fed. Cir. 1987) (Newman, J., concurring) (Evidence rebutted prima facie case by comparing claimed invention with the most relevant prior art. Note that the majority held the Office failed to establish a prima facie case of obviousness.); *In re Chapman*, 357 F.2d 418, 148 USPQ 711 (CCPA 1966) (Requiring applicant to compare claimed invention with polymer **suggested** by the combination of references relied upon in the rejection of the claimed invention under 35 U.S.C. 103 "would be requiring comparison of the results of the invention with the results of the invention." 357 F.2d at 422, 148 USPQ at 714.).

(Emphasis applicants').

In the absence of proper reasoning or evidence showing that the properties of the fibers of the invention are expected, the Office's rejections are rebutted by the data in the present application and cannot be maintained.

Reversal of the rejection of claims 1, 5-11, 13, 15, 16, 19, 20, 21, 23 under 35 U.S.C. 103(a) as being unpatentable over Obuchi in view of Tan and in further view of Kondo and Zeitler is in order and is respectfully requested.

(2) Rejection under 35 U.S.C. 103(a) over Obuchi (U.S. Patent No. 6,417,294) in view of Tan (WO 02/12395; U.S. Patent No. 6,710,135 used as English equivalent) and in further view of Kondo (U.S. Patent No. 5,593,778) and Zeitler (U.S. Patent No.

5,811,508)

(a) Claims 1, 5-11, 13, 15, 16, 19, 20, 21, 23 and 26-31

Obuchi is cited as disclosing films formed from polyester compositions containing nucleating agents. The polyester is a polylactic acid having a molecular weight of 90,000-500,000. The nucleating agent is 0.1-10 wt% of the composition and can be ethylenebislauramide and hexamethylenebisoleamide. Obuchi discloses extrusion molding, but does not disclose the use of melt spun yarn. Tan, Kondo and Zeitler are cited for their disclosures and teachings as explained above.

The arguments presented above with respect to the 35 U.S.C. § 103(a) rejection of claims 1, 5-11, 13, 15, 16, 19, 20, 21, 23 and 26-31 over Nishimura, Tan, Kondo and Zeitler apply with equal force to the rejection of these claims under 35 U.S.C. § 103(a) over Obuchi, Tan, Kondo and Zeitler. More specifically:

(1) the office has not supported a case of prima facie obviousness of the claims of the application and, when the teachings of the cited prior art as a whole are considered, a person of ordinary skill in the art would not have had a reasonable expectation that fibers having a fineness of 0.1-10 dtex could be successfully produced from the polyester compositions of Obuchi by melt spinning; and

(2) the combination of Obuchi, Tan, Kondo and Zeitler fails to disclose or suggest the properties resulting from the use of the specific fatty acid amides according to the present invention in the melt-spinning of polylactic acid, for the reasons explained above.

(3) Rejection under 35 U.S.C. 103(a) over Nishimura, Tan, Zeitler and Kondo or Obuchi, Tan, Zeitler and Kondo, in further view of Anderson (U.S. Patent No. 4,009,513)

(a) Claims 13, 15, 24 and 25

This rejection depends on the rejection of claim 1. Since claim 1 has been shown to be allowable, claims 13, 15, 24 and 25 are also allowable.

(4) Rejection under 35 U.S.C. 103(a) over Nishimura, Tan, Zeitler and Kondo or Obuchi, Tan, Zeitler and Kondo, in further view of Yamakita (U.S. Patent Publication No. 2003/0079297)

(a) Claims 12, 14, 17, 18 and 22

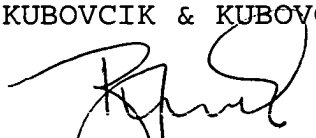
This rejection depends on the rejection of claim 1. Since claim 1 has been shown to be allowable, claims 12, 14, 17, 18 and 22 are also allowable.

In view of the foregoing arguments, appellant respectfully requests that the final rejections of the Primary Examiner be reviewed and reversed.

Please charge any required fees or credit any overpayment to our Deposit Account No. 111833.

Respectfully submitted,

KUBOVCIK & KUBOVCIK



Ronald J. Kubovcik
Reg. No. 25,401

Crystal Gateway 3
Suite 1105
1215 South Clark Street
Arlington, VA 22202
Tel: (703) 412-9494
Fax: (703) 412-9345
RJK/ff

(viii) CLAIMS APPENDIX

1. Polylactic acid fiber comprising a polylactic acid containing fatty acid bisamide and/or alkyl-substituted fatty acid monoamide in an amount of 0.1 to 5 weight % in relation to the whole of fiber, said fatty acid bisamide and alkyl-substituted fatty acid monoamide having a melting point of 100 °C or higher, wherein said fiber is produced by a melt-spinning method and has a b* value in fiber color system of L*a*b* in the range of -1 to 5 and a single fiber fineness of 0.1-10 dtex, and the fiber-constituting polylactic acid is 40 eq/t or less in carboxyl end group amount.

5. The polylactic acid fiber according to claim 1, wherein fiber-constituting polylactic acid is from 50,000 to 500,000 in weight-average molecular weight.

6. The polylactic acid fiber according to claim 1, of which the strength is 2.0cN/dtex or higher.

7. The polylactic acid fiber according to claim 1, of which the elongation is in the range of 15 to 70%.

8. The polylactic acid fiber according to claim 1, of which the boiling-water shrinkage rate is in the range of 0 to 20%.

9. The polylactic acid fiber according to claim 1, of which the fiber-constituting component has an exothermic peak of crystallization in a temperature decrease at 100 °C or higher.

10. The polylactic acid fiber according to claim 1, which has a form of filament.

11. The polylactic acid fiber according to claim 10, wherein said filament is 1.5% or less in thickness unevenness of U%.

12. The polylactic acid fiber according to claim 10, which is not treated by crimping and has on the surface thereof at least one type of smoothing agent selected from fatty acid ester, polyvalent alcohol ester, ether ester, silicone and mineral oil.

13. The polylactic acid fiber according to claim 10, which has crimps made by fluid texturing.

14. The polylactic acid fiber according to claim 13, which has on the surface thereof at least one type of smoothing agent selected from fatty acid ester, polyvalent alcohol ester, ether ester, silicone and mineral oil.

15. The polylactic acid fiber according to claim 13, having the following properties:

crimping elongation rate: 3 to 35%

single fiber fineness: 3 to 35dtex

degree of modified cross section: 1.1 to 8

16. The polylactic acid fiber according to claim 10, which has crimps made by false twist texturing.

17. The polylactic acid fiber according to claim 16, which has on the surface thereof a smoothing agent mainly constituted with polyether.

18. The polylactic acid fiber according to claim 17, wherein said polyether is a compound or a derivative thereof in which alkylene oxide with the carbon number of 2 to 4 is added through copolymerization to alcohol having one or more of hydroxyl groups within molecule.

19. The polylactic acid fiber according to claim 16, having the following properties;

strength at 90 °C $\geq$ 0.4cN/dtex,

CR $\geq$10%,

non-untwisted number $\leq$3 pieces/10m

20. The polylactic acid fiber according to claim 19, wherein the boiling-water shrinkage rate is 15% or lower.

21. The polylactic acid fiber according to claim 1, which has a form of staple fiber.

22. The polylactic acid fiber according to claim 21, which has on the surface thereof at least one type of smoothing agent selected from fatty acid ester, polyvalent alcohol ester, ether ester, silicone and mineral oil.

23. The polylactic acid fiber according to claim 21, having the following properties;

crimp number ≥ 6 /25mm,

crimping rate ≥10%.

24. A yarn package wherein the filament according to claim 10 is wound.

25. The yarn package according to claim 24, wherein the saddle of the package is 7mm or lower.

26. A fiber product in which the polylactic acid fiber described in claim 1 is used at least partially.

27. The fiber product according to claim 26, in which the fiber product is a knitting fabric.

28. The fiber product according to claim 26, in which the fiber product is a woven fabric.

29. The fiber product according to claim 26, in which the fiber product is a nonwoven fabric.

30. The fiber product according to claim 26, in which the fiber product is a carpet.

31. The fiber product according to claim 26, wherein the solidity to dry friction is third grade or higher and the solidity to wet friction is second grade or higher.

(ix) EVIDENCE APPENDIX

Declaration under 37 C.F.R. § 1.132 of Katsuhiko MOCHIZUKI

(x) RELATED PROCEEDINGS APPENDIX

None